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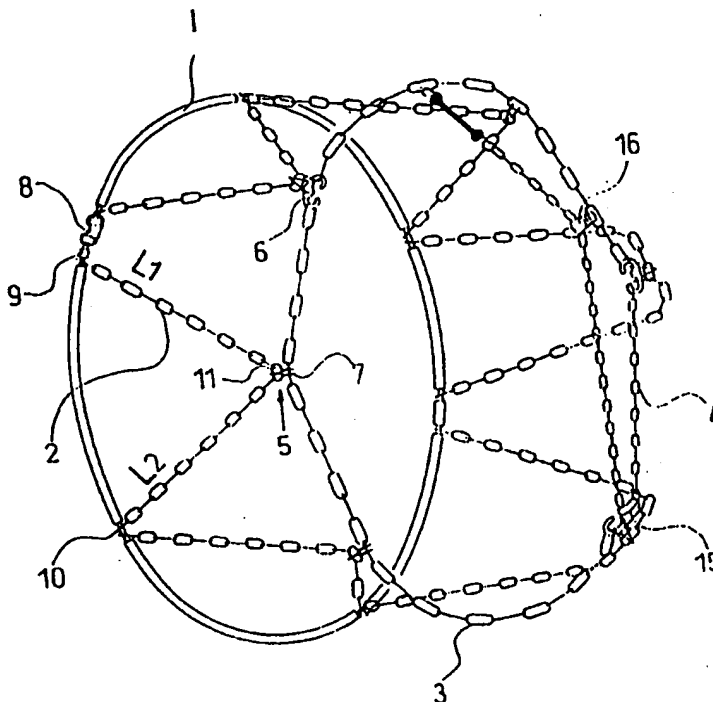
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/TR99/00014</p> <p>(22) International Filing Date: 23 March 1999 (23.03.99)</p> <p>(30) Priority Data: 98/01135 17 June 1998 (17.06.98) TR</p> <p>(71) Applicant (for all designated States except US): ATLI ZINCIR IGNE VE MAKINE SANAYI A.Ş [TR/TR]; Davutpaşa Cad. No. 36, 34020 Topkapi, Istanbul (TR).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): GÖKŞİN, Korhan [TR/TR]; Davutpaşa Cad. No. 36, 34020 Topkapi, Istanbul (TR).</p> <p>(74) Agent: ANKARA PATENT BUREAU LTD.; Şehit Adem Yavuz Sokak 8/22, Kizilay, 06440 Ankara (TR).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>

(54) Title: ANTI-SKID TIRE CHAIN WITH ZIGZAG PATTERN CROSS CHAIN ELEMENT OF VARIABLE LENGTHS

## (57) Abstract

The inner (1) and outer (3) peripheral elements are interconnected with cross chains (2) mounted in V-shape. The two free ends of these V-shaped cross chains (2) are fixed to the steel wire rope (1) which is the inner peripheral element, whereas the intermediary parts forming the pointed tip of 'V', pass freely through the eyelet of a particular hook (7) which is twisted 90° and provided on the outer peripheral element (3). Thus the intermediary section forming the pointed tip of 'V' shaped zigzag cross chain (2) being the tread, slides freely through the ringed hook (7) and thus provides the variations in the lengths L<sub>1</sub> and L<sub>2</sub>. During the fitting and stretching procedures, L<sub>1</sub> and L<sub>2</sub> lengths are changed by sliding the zigzag cross chains through the ringed hooks (7) and thus the chains can adapt themselves to the geometry and tensile force of the tire.



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**ANTI-SKID TIRE CHAIN WITH ZIGZAG PATTERN CROSS CHAIN  
ELEMENT OF VARIABLE LENGTHS**

The present invention is related to an anti-skid tire chain developed for an  
5 easy assembly and adaptation on the vehicle tires, which avoids skidding and  
which increases the traction, cornering and braking safeties on snowy / icy and  
slippery surfaces.

Until now, several types of snow-or anti-skid chains with various properties  
10 have been manufactured, showing differences in the facility of fitting /  
dismantling, and fitting on the tire tread, in the traces they leave on the ground  
which are called the pattern of the chain.

All these chains exhibit differences from each other with regard to their  
15 skidding and cornering/braking safeties, and to the pattern of the cross chains as  
well as to the traces left on the ground. Major types of anti-skid chains are as  
follows :

- 20 - Type-E antiskid chains with a plurality of cross chains joining the  
vertical side (peripheral) chains at spaced intervals like a ladder.
- Type-Z zigzag or model-Z anti-skid chains, fastened to the inner and  
other peripheral elements with a zigzag pattern, the traces they leave on  
the ground are shaped as VVVVVV.
- 25 - Type-Y anti-skid chains with cross chains patterned in Y-shape that  
leave the same traces on the ground.
- Type-X anti-skid chains, wherein the cross chain elements are shaped as  
30  $X > - <$  or as  $> - < > - <$ , leaving X-shaped or rhombus shaped traces on  
the ground.

Among all these chain types, the type-E chains with a ladder pattern are the weakest from the point of avoiding sliding and of braking and cornering safeties. As the cross chain elements are arranged in spaced intervals, in certain areas there are not any cross chains between the tire and the slippery road, which results in  
5 the contact of the naked tire with the slippery road. As the Z, Y or X patterned chains always comprise an anti-skid chain element between the tire and the slippery road, and as this chain element is assembled diagonally, the traction and braking forces always have resultant forces in the forward and lateral directions. This results in a high traction and braking, and cornering safety.

10

The anti-skid chain elements with Z-zigzag pattern between the said chains could not be subject to mass production due to such problems as adaption to the tire and tension, although they are highly safe and economical.

15

The anti-skid chain has to fit the tire completely (right size and tread shape) and all of its elements should be well-tensioned in order to provide an easy assembly and a safe usage. Those chains which do not fit on the tire, which are loose and not well-stretched, break in a short time and do not function properly.

20

The stretching of the chains tightly is generally provided by stretching the parts that fit on the outer side wall of the tire, also named as the outer peripheral elements. The inner peripheral elements (steel wire rope, hoop or chain) form a (loop) circle of a constant length by closing in almost all anti-skip chain arrangements.

25

On the other hand the outer peripheral elements (steel wire rope, hoop or chain) have a stretching arrangement called the stretching system, providing the stretching of both the outer peripheral element and the cross chain clearance (looseness).

30

During the said stretching process no problems arise from the anti skid chains with Y or X pattern as both of them contain a core ring which makes displacements on the tread of the tire in order to adapt itself to the tire. However the existing zigzag cross-chains of the anti skid chains with Z or zigzag pattern  
5 cannot be stretched without looseness (clearance) as they are fixed to the inner and outer peripheral elements from both of their ends. No matter from which point they are stretched, when one of the cross chains fixed to the same point is stretched, the other remains loose. In fact this phenomenon is as required in geometry; there is only a single point which is of the same distance from two  
10 points. As the distances would change at a different point, clearances or loosenings would occur.

In case the zigzag cross chains are fastened to the inner and outer peripheral elements at two ends, a complete and perfect stretching may be achieved only  
15 when the tensioning force is in line with the perpendicular bisector of these cross chains. Otherwise, for all kinds of stretching forces outside this force which may be in other directions, if the cross chains are fixed, a proper tensioning cannot be performed as the resultant forces at the cross chains will be different.

20 The object of the present invention is to provide an anti-skid tire chain with zigzag cross chains which can be stretched easily without looseness and which can thus fit properly on the tire.

The anti skid tire chain realized in order to achieve the said object of the  
25 invention is illustrated in the attached drawings wherein :

Figure 1. is the perspective view of the anti skid tire chain being the subject of the present invention,

Figure 2. in the perspective view of the conventional zigzag anti skid tire chain with fixed connection (fastening) point [for the fastening of  
30 cross chain elements to the peripheral elements]

Figure 3, is a view of an embodiment of the invention employing a ring instead of a ringed hook.

5 Figure 4, is a view showing the realization of the invention by passing it through the outer peripheral chain link instead of the ringed hook.

Şekil 5, is a view of an embodiment of the invention employing a plastic or metallic piece instead of a ringed hook.

10 Şekil 6, is a view showing the embodiment of the invention with ringed hook, as fitted on the tire.

Şekil 7, shows the embodiment of the invention as laid open on the ground, being ready to be fitted on a tire.

15 Şekil 8, is the enlarged view showing the zigzag cross chains together with the ringed hooks through which the chains pass in a sliding manner.

Şekil 9, shows the zigzag cross chains fit on the tire tread in variable lengths, under various assembly and stretching conditions.

Şekil 10, shows the anti skid tire chain of the invention as laid opened.

20 Şekil 11, is an embodiment of the invention wherein the ends of the zigzag cross chains of the said anti skid tire chains are engaged to the inner peripheral element, by means of a hook instead of being engaged directly by their own link .

25 Şekil 12, shows an alternative embodiment of the invention wherein the zigzag cross elements are made of steel wire rope, rubber and rubber pieces instead of chains.

Figure 13, shows the embodiment of the invention as laid open on the ground, being ready to be fitted on a tire.

30 Figure 14, shows the locking of the inner peripheral element while fitting the antiskid tire chain on the tire.

Figure 15. shows the closing of the outer peripheral element while fitting the antiskid tire chain on the tire.

Figure 16. shows the centering of the anti-skid tire chain on the tire while being fitted on the tire.

5 Figure 17. shows the final closing and stretching procedure while fitting the anti skid tire chain on the tire.

Figure 18. shows the view of an alternative chain made with ringed hooks both on the inner and outer peripheral elements, consisting of continuous lengths of cross chains.

10

The components shown in the drawings are numerated as follows :

1. Inner peripheral element
2. Zigzag cross chains (paddles)
- 15 3. Outer peripheral element
4. Tensioning (chain)
5. Stretching point
6. Closing plate
7. Ringed hook
- 20 8. Inner lock
9. Inner lock connection end
10. Fixed end-link of the zigzag cross chain
11. Sliding link of the zigzag cross chain passing through the ringed hook
12. Ring that may be used instead of the ringed hook
- 25 13. Outer peripheral chain link that can be used instead of ringed hook.
14. Plastic ring to be used instead of ringed hook.
15. Stretching channel
16. Stretching guide (Shortening ring)
17. Fixed hook.

30

The subject of the invention is an anti skid tire chain preventing sliding and increasing traction and braking security.

5 The said zigzag padded anti skid chain with variable lengths, of the invention consists of a flexible steel wire rope (1) or a loop or a chain fitted on the inner side wall of the tire (inner peripheral element), and a chain (3) fitted on the outer side wall of the tire (outer peripheral element) as well as of chains (2) with zigzag pattern, (cross chain elements) connecting the two elements (1) and (3) and preventing skidding of the tread of the tire.

10

It also includes a stretching system (4) which ensures an anti-sag stretching of the entire chain system.

15 A locking mechanism (8 and 9) is foreseen for the connection of the ends of the steel wire rope coated by a plastic hose forming the inner bordure of the anti skid chain, or the ends of the hoop or the chain.

20 The subject of the invention is a cross chain which eliminates the present disadvantages in order to provide a proper and full stretching of the cross chains in anti-skid tire chains with zigzag cross chains and which provides a relative differentiation without modifying the sum of the lengths ( $L_1$  and  $L_2$ ) by ensuring their free movement of the forces on the stretching point (5) according to their resultant forces.

25 The zigzag cross chains (2) being the subject of the invention (Figure 1) are anti-skid chains having a monobloc cross chain arrangement which has been fastened to the inner peripheral element (1) by means of their end link (10) and which can freely move inside the ringed hook (7).

30 They match and fit the tire completely without any clearance as the result of the  $L_1$  and  $L_2$  lengths being formed according to the forces and gaps, by means of



the zigzag cross chains (2) which slide and pass through the ringed hook (7), whatever the orientation of the stretching forces and the geometry of the tire is.

The ringed hook (7) elements through which the zigzag cross chains (2) of the invention pass, are special hooks twisted 90°.

In the anti-skid chains of the present invention, rings (12), chain link (13) or any rings of metal and plastic (14) may be used instead of these hooks.

10 The anti skid tire chain of the invention, with zigzag cross chains, is provided with a plastic coated steel wire rope which forms the inner peripheral element (1). Steel, plastic, rubber or chain may also be used instead of this rope. Both ends of the lengths of chain forming the zigzag cross chains (2) are fixed on the steel wire rope. In Figure 10 this connection is shown as engaging the end links (10) of the chain directly to the steel wire rope (1). As seen in Figure 11, the ends of the cross chains may also be fastened to the peripheral element by means of such components (17) as loop, eyelet, hook, etc.

20 The anti skid chain of the invention also consists of an outer peripheral element (3), a locking mechanism (8 and 9) for this chain (3) and a tension chain (4) providing the stretching of the entire chain assembly.

25 The inner (1) and outer (3) peripheral elements are interconnected with cross chains (2) mounted in V-shape. The two free ends of these V-shaped cross chains (2) are fixed to the steel wire rope (1) which is the inner peripheral element, whereas the intermediary parts forming the pointed tip of 'V', pass freely through the eyelet of a particular hook (7) which is twisted 90° and provided on the outer peripheral element (3). The pointed tip of 'V' shaped zigzag cross chain (2) forming the tread, slides freely through the ringed hook (7) and thus provides the variations in the lengths  $L_1$  and  $L_2$ .

Figure 12 shows alternative embodiments of zigzag cross chain. Zigzag cross chain elements (2) may be made of steel wire rope, rubber, plastic, instead of a chain.

The anti skid tire chain is laid on the ground, (Figure 13) the inner  
5 peripheral element (steel wire rope) is hold from its end part (9) and passed behind the tire. The inner peripheral element is hold from its both ends (8 and 9) and closed at the front, at the level of the tire rim (Figure 14). The outer peripheral element is closed by being fastened to the closing plate (6) (Figure 15). The inner peripheral element is pushed to the back the tire and the zigzag cross  
10 chains are centered at the back of the tire (Figure 16). The tension chain (4) is passed through the tension groove (15) and shortening ring (16) and is engaged to the rubber stretching outer peripheral element (Figure 17).

Upon the implementation of the subject of the invention, a simple, handy,  
15 easy to fit, stretchable and reliable anti-skid tire chain with a cross chain element always preventing skidding between the tire and the ground, is obtained by providing the adaptation of the chains to the geometry and tensile force of the tire by means of the variation of  $L_1$  and  $L_2$  lengths by sliding the zigzag cross chains (2) through the ringed hooks, during assembling and stretching procedures.

## CLAIMS

1. An anti-skid tire chain with zigzag cross chains of variable lengths, which is fitted on the tires in order to prevent the vehicle tires from sliding and slipping on a slippery surface, characterized in that it consists of an inner peripheral element (1) being a steel wire rope, an outer peripheral element (3) being a chain and the zigzag cross chains (2) connecting the said two peripheral elements and that two free ends of each length of the zigzag cross chains, made of chain pieces in a continuous length,  $L = L_1 + L_2$ , thus forming the tread band, are connected to the steel wire rope which is the inner peripheral element and thus are brought to a V-shape (10) which makes up the zigzag cross chains when juxtaposed and the intermediary sections of the V-shaped cross chains are passed through the ringed hooks (7) provided on the outer peripheral element and that the zigzag cross chains freely sliding through the ringed hooks lead to variations in the  $L_1$  and  $L_2$  lengths.
2. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claim 1, characterized in that the inner peripheral element (1) is a rigid steel or steel hoop or plastic or rubber or chain.
3. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1 or 2, characterized in that the outer peripheral element (3) is a steel wire rope or steel hoop or plastic or rubber.
4. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-3, characterized in that the cross chains are steel wire rope or plastic or rubber.
5. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-4, characterized by the ringed hooks (7) provided on the outer peripheral chain, through which the intermediary sections of the V-shaped

cross chains are passed thus enabling the free sliding of the chain and providing variations in  $L_1$  and  $L_2$  lengths.

- 5 6. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-5, characterized by a ring (12) used instead of the said ringed hooks (7).
- 10 7. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-5, characterized by an outer peripheral element (3) chain link (13) used instead of the said ringed hooks (7).
- 15 8. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-5, characterized by a plastic ring (14) used instead of the said ringed hooks (7).
- 20 9. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-8, characterized in that the chain forming the zigzag cross chain is a continuous, one-piece length of chain wherein ringed hooks (7) are used in inner and outer peripheral elements.
- 25 10. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-9, characterized by cross chains (2) with a zigzag pattern, the free ends of which are fixed on the inner peripheral element (1) and the intermediary sections being able to slide freely through the ringed hook (7) provided on the outer peripheral element (3), are mounted in a V-shape.
- 30 11. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-10, characterized by the cross chains (2) formed by pieces of chain, the  $L_1$  and  $L_2$  lengths of which are variable.

12. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-11, characterized in that the ringed hooks (7) providing a free sliding passage for the cross chains (2) are on the peripheral element on one side.

5

13. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claim 12, characterized in that the ringed hooks (7) providing a free sliding passage for the cross chains (2) are on the peripheral element on both sides.

10

14. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claims 1-13, characterized in that the anti-skid cross chains (2) are formed in a zigzag pattern.

15 15. An anti-skid tire chain with zigzag cross chains of variable lengths according to Claim 14, characterized in that the anti-skid cross chains (2) are formed in a "VVVVV" or "Z" pattern.

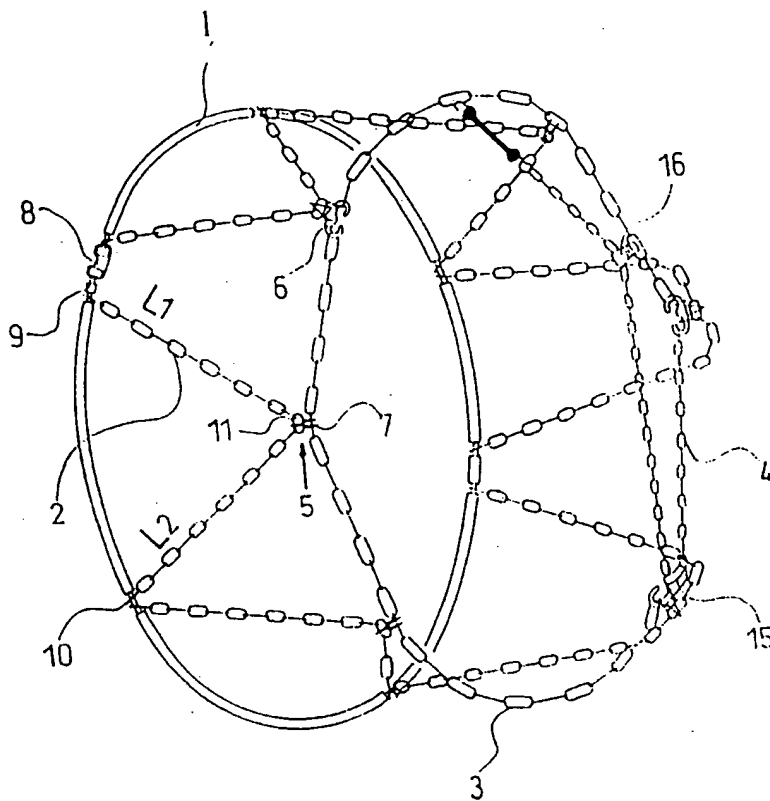


FIG-1

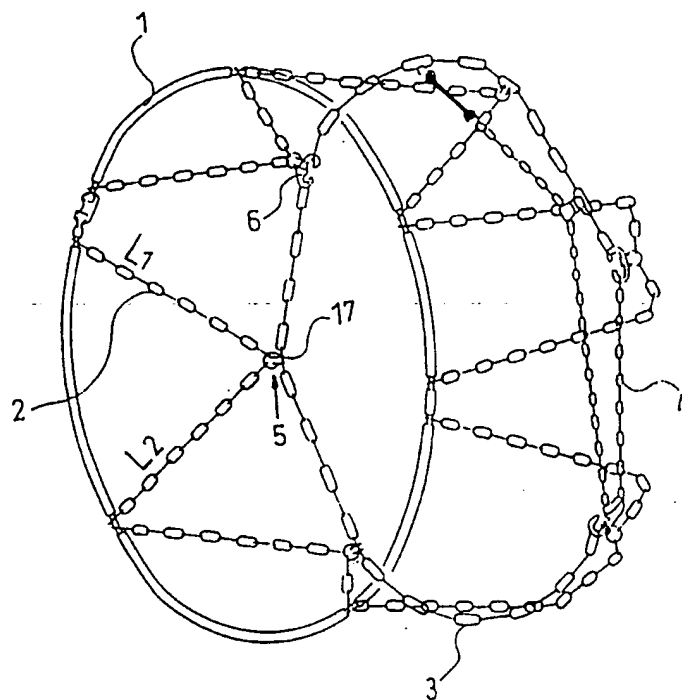


FIG-2

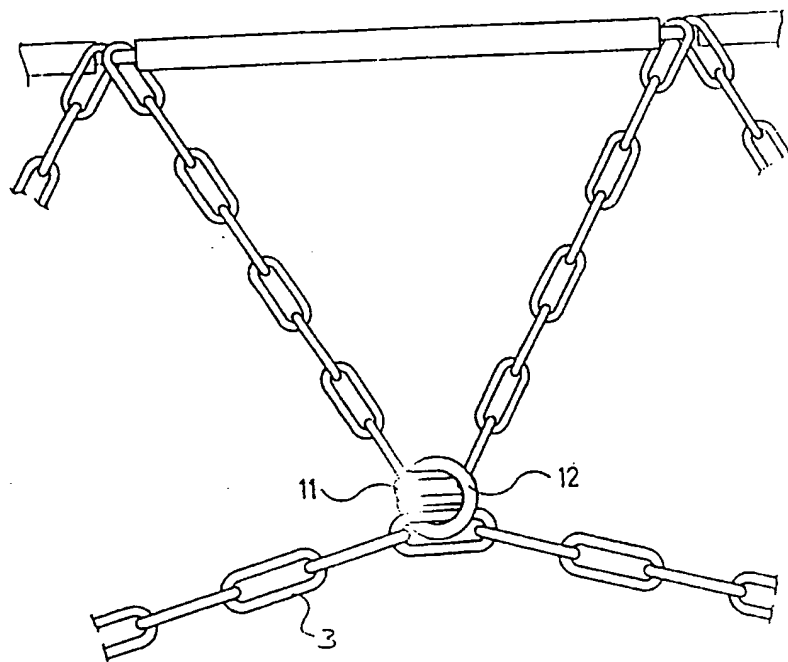


FIG-3



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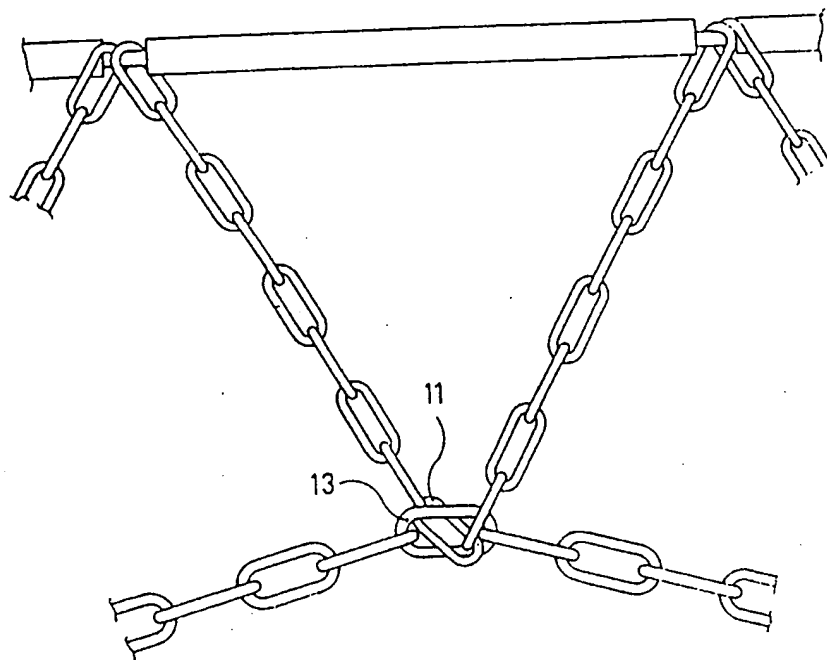
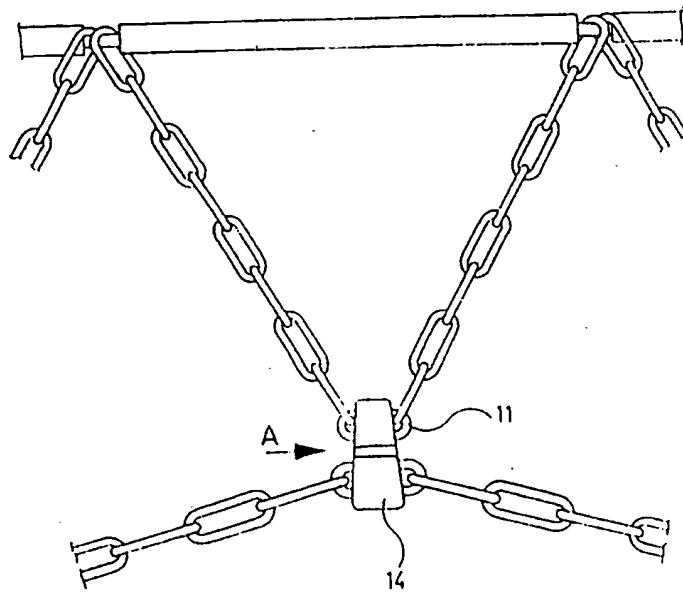


FIG-4

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A View

FIG-5

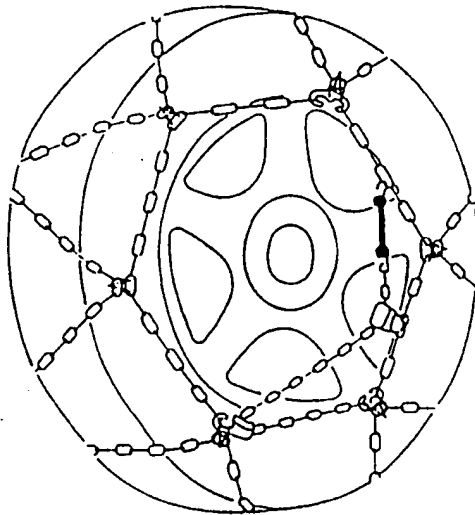


FIG-6

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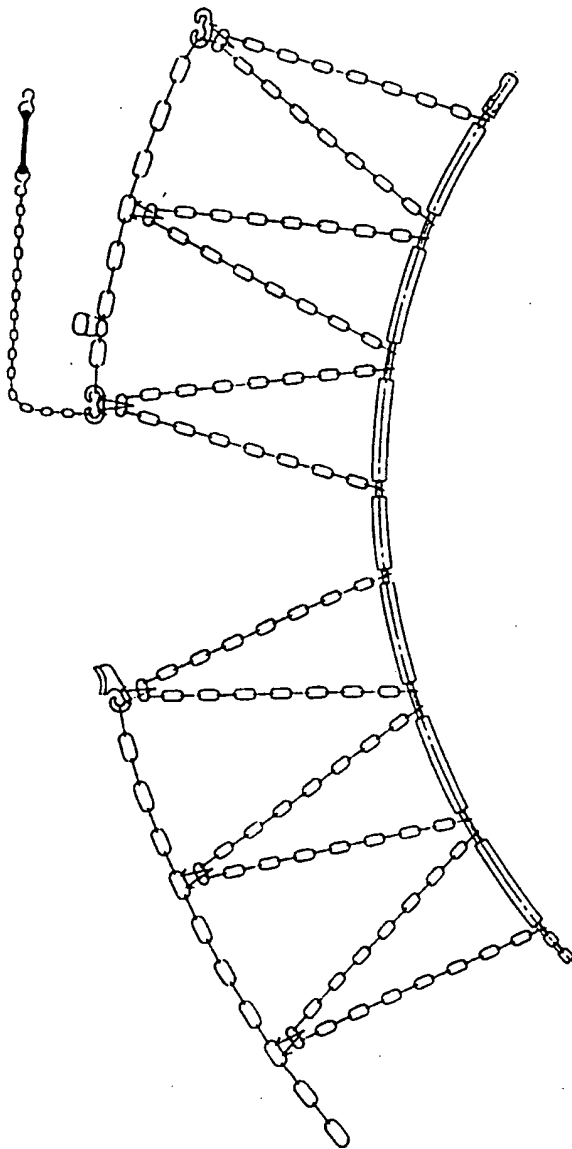


FIG-7

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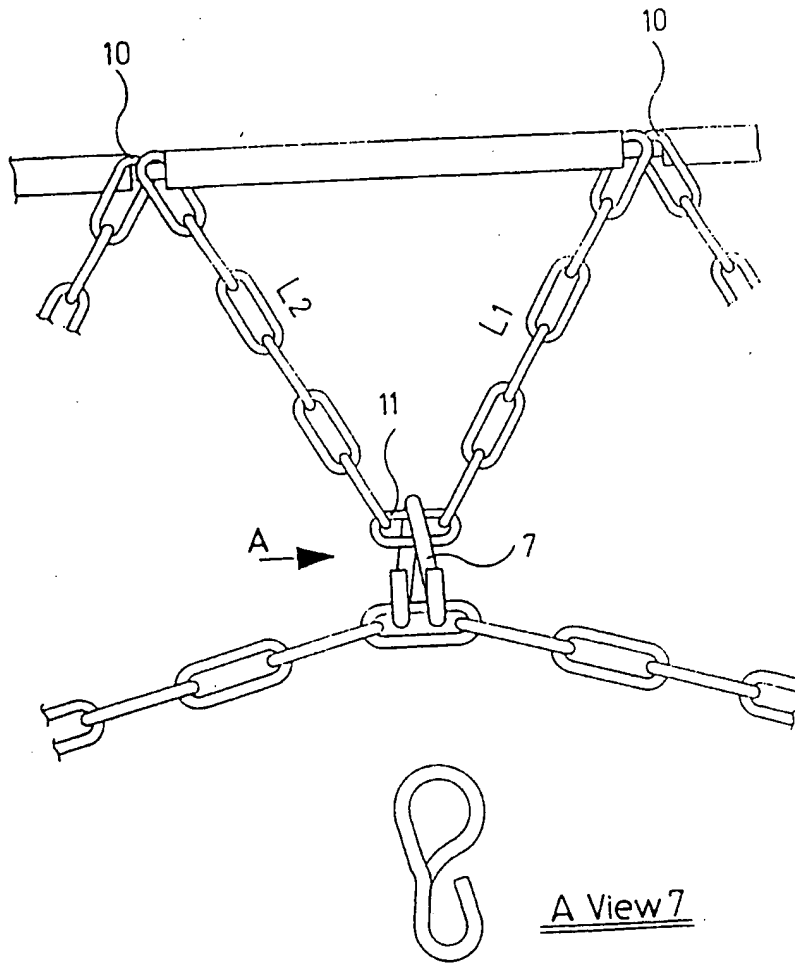
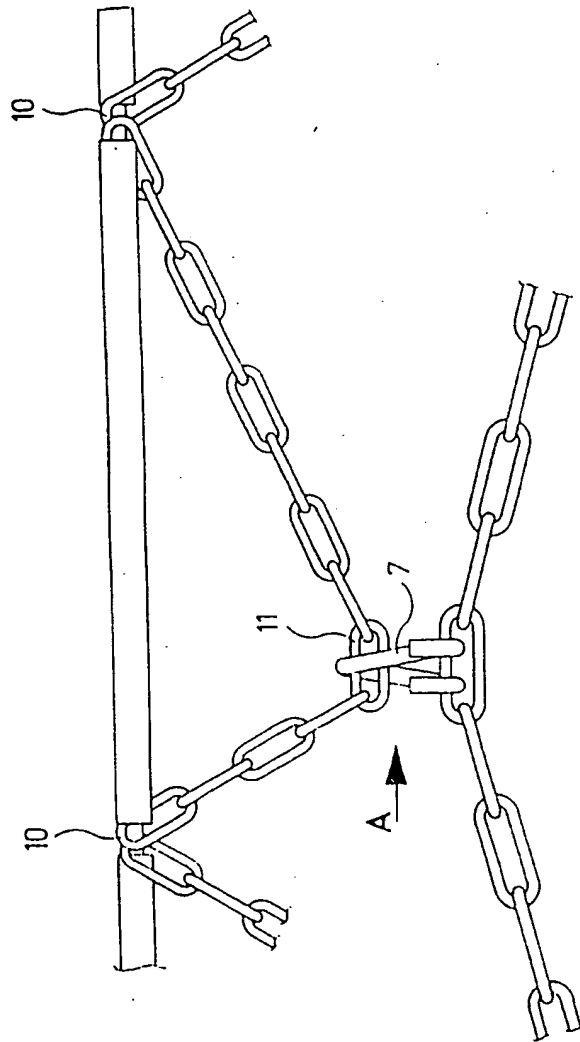


FIG-8

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A View 7

FIG-9

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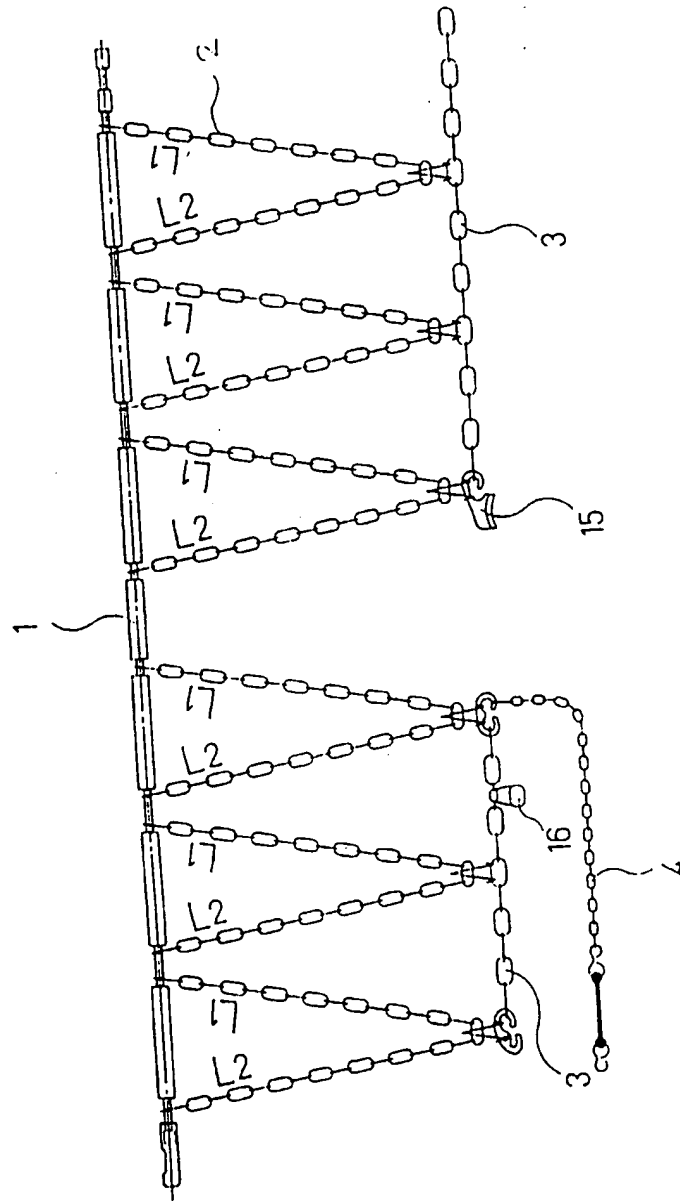


FIG-10

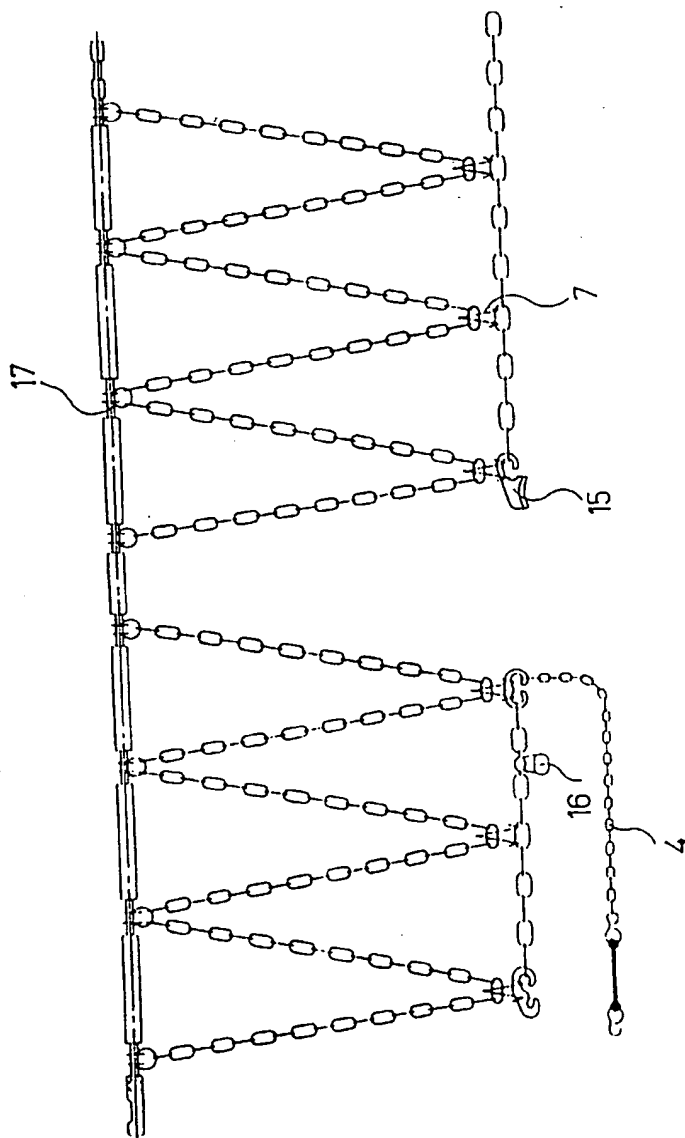


FIG-11



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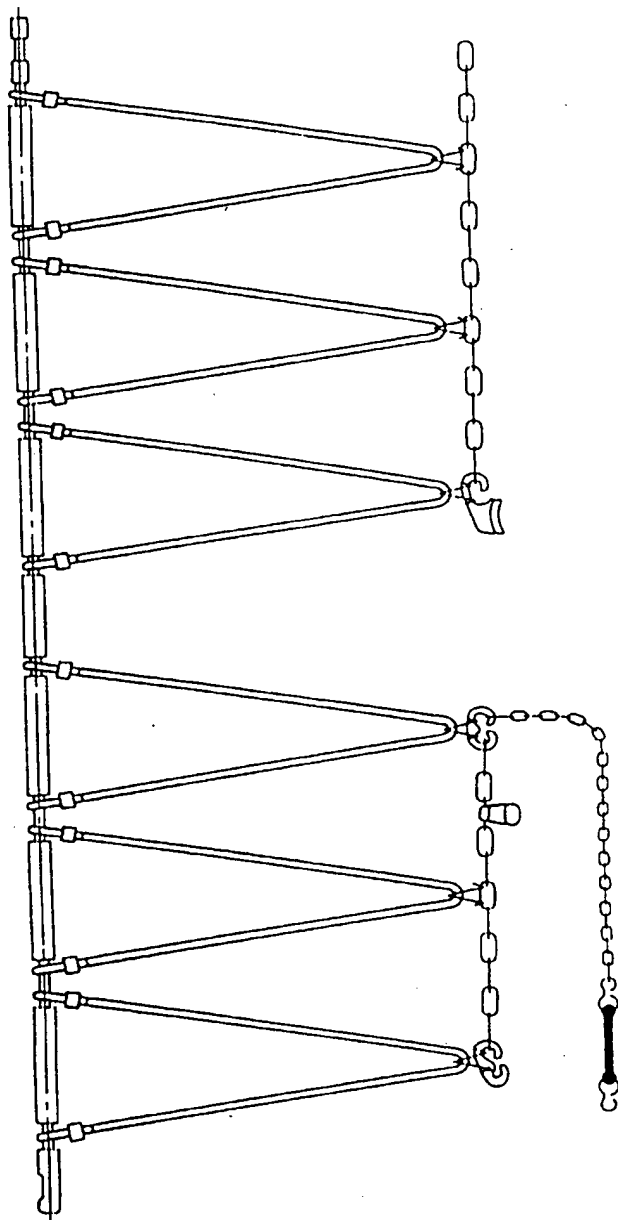


FIG -12

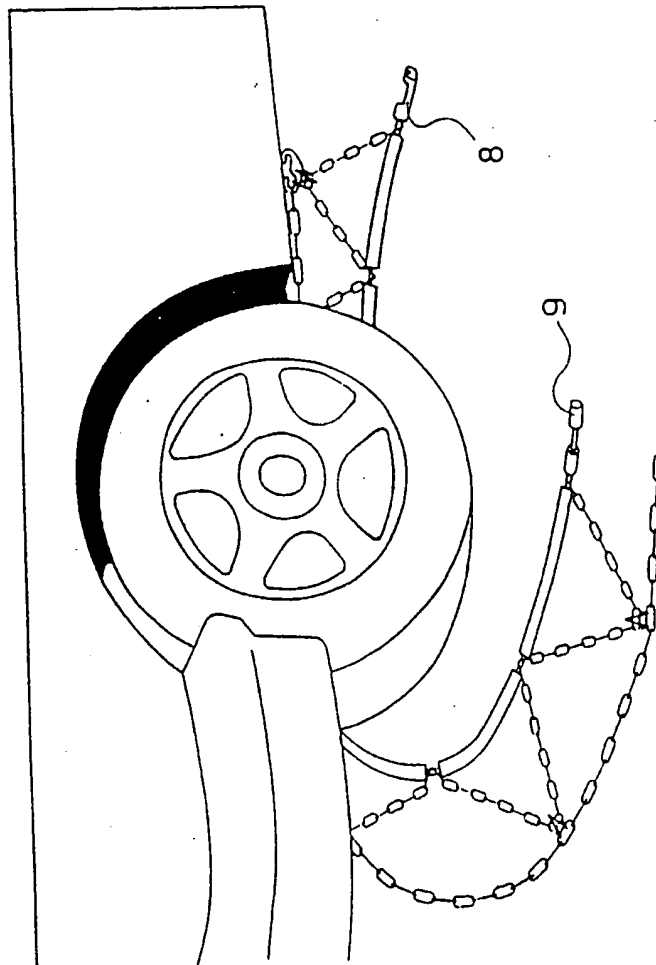


FIG-13

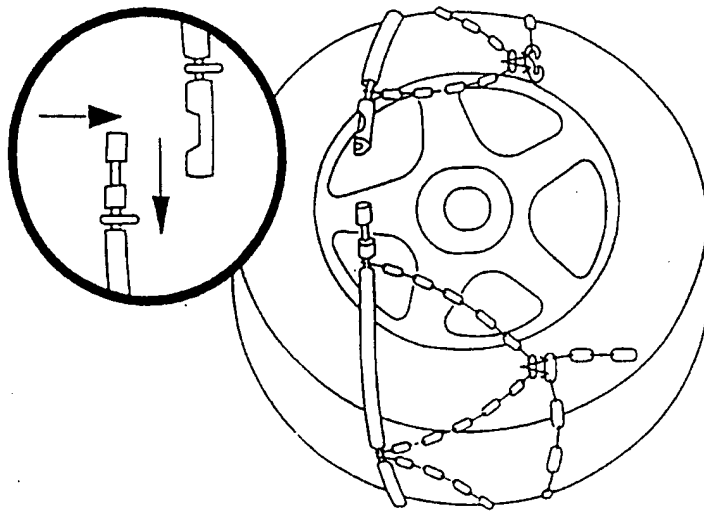


FIG-14

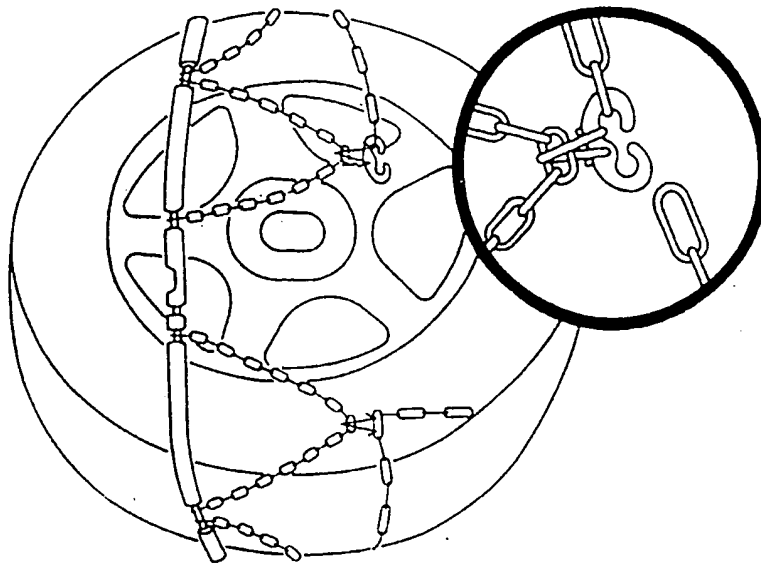


FIG-15

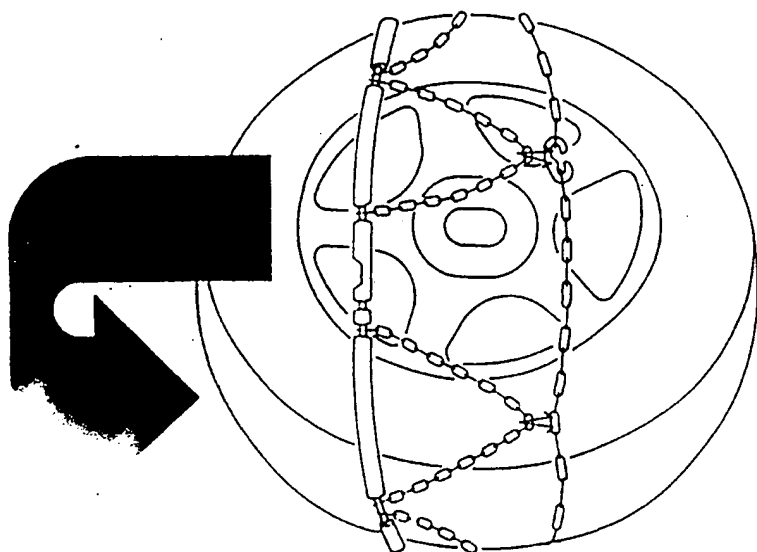


FIG-16

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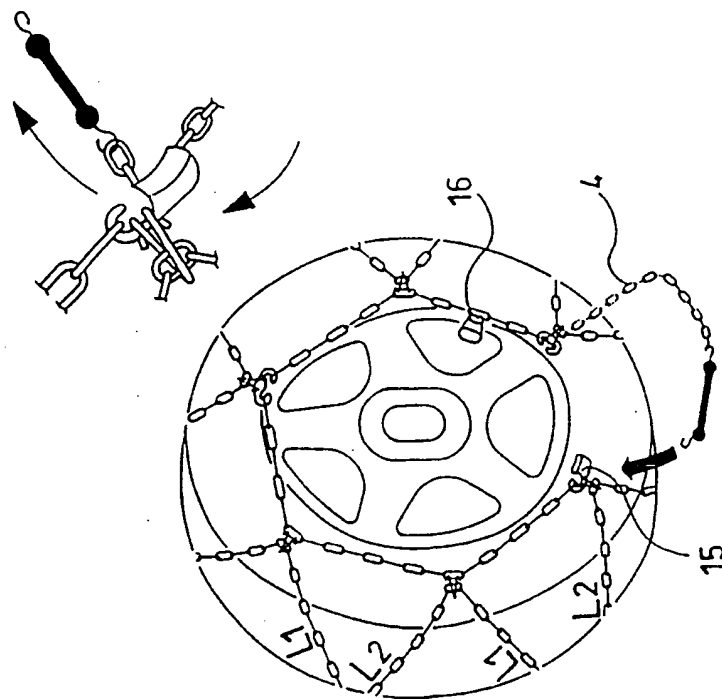


FIG-17

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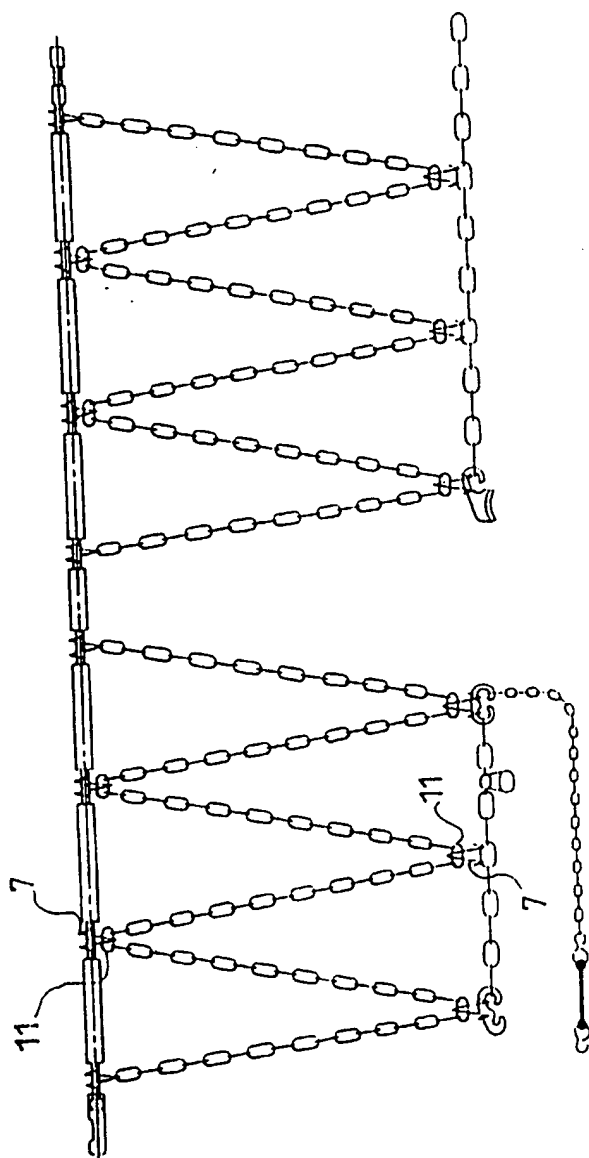


FIG-18

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/TR 99/00014

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC <sup>6</sup> : B 60 C 27/06		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC <sup>6</sup> : B 60 C 27/00, 27/06, 27/10		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPODOC		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2 596 331 A1 (KONIG S.P.A.), 02 October 1987 (02.10.87), fig.1-4; page 3, line 31 - page 4, line 6.	1-3, 5-15
Y	CH 612 631 A5 (NÄF - BOLLI), 15 August 1979 (15.08.79), fig.1; page 2, column 2, lines 28-52.	1-3, 6, 10-15
Y	DE 23 47 607 A (RUD-KETTENFABRIK RIEGE & DIETZ), 28 March 1974 (28. 03. 74), fig 1-3.	5, 9
Y	DE 23 02 292 A ( FA. AUGUST THIELE), 25 July 1974 (25.07.74), fig.2.	7
Y	EP 0 385 057 A1 (CONTIWEISS WEISSENFELS GMBH & CO.KG), 05 September 1990(05.09.90), fig.1; column 15, lines 30-36.	8
A	CH 153 355 A (RICHARD - SAUDOU), 01 June 1932 (01.06.32), fig.1,2.	1, 5, 12, 13
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

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